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A new species of *Physalaemus* (Anura, Leptodactylidae) from the Atlantic rain forest of northeastern Brazil

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A new species of leptodactylid frog is described from Passo de Camaragibe, State of Alagoas, northeastern Brazil. The new species is a member of the *Physalaemus signifer* group, and is characterized by its medium size, snout protruding in lateral view, dorsolateral light fold extending from the posterior corner of the eye to the inguinal region, and large outer metatarsal tubercle. Description of the tadpole is provided.



INTRODUCTION

The genus *Physalaemus* is known from Mexico to southern South America, with 37 recognized species (FROST, 1985; DUELLMAN, 1993). Four species groups are currently recognized in the genus: *P. biligonigerus* group, *P. cuvieri* group, *P. pustulosus* group and *P. signifer* group (LYNCH, 1970); however, *P. deimaticus* Sazima & Caramaschi, 1986 and *P. rupestris* Caramaschi, Carcerelli & Feio, 1991 are not presently placed in any species group (SAZIMA & CARAMASCHI, 1986; CARAMASCHI et al., 1991). The *P. signifer* group is characterized by its small to moderate size (15-35 mm SVL), slender body, smooth skin, first finger shorter than the second, no inner tarsal tubercle, small, non-compressed metatarsal tubercles, small to large inguinal glands, and parotoid glands absent (LYNCH, 1970). The species presently allocated to the *P. signifer* group are *P. bokermanni* Cardoso & Haddad, 1985, *P. crombiei* Heyer & Wolf, 1989, *P. maculiventris* (A. Lutz, 1925), *P. moreirae* (Miranda-Ribeiro, 1937), *P.*



nanus (Boulenger, 1888), *P. obtectus* Bokermann, 1966, *P. olfersii* (Lichtenstein & Martens, 1856), *P. signifer* (Girard, 1853) (Frost, 1985; Duellman, 1993), and *P. spiniger* (Miranda-Ribeiro, 1926) (see Haddad & Pombal, in press). *Physalaemus franciscae* Heyer, 1985 is a synonym of *P. moreirae* (Caramaschi & Caramaschi, 1991). Herein, we describe a new species of the *P. signifer* group from northeastern Brazil.

Material and methods

Specimens used in the description or examined for comparisons are deposited in AL-MN (Adolpho Lutz Collection, deposited in Museu Nacional, Rio de Janeiro, Brazil), CFBH (Célio F. B. Haddad Collection, deposited in Departamento de Zoologia, Universidade Estadual Paulista, Rio Claro, Brazil), MNRJ (Museu Nacional, Rio de Janeiro, Brazil), ZUEC (Museu de História Natural, Universidade Estadual de Campinas, Brazil). Additional specimens examined are listed in app. 1.

Abbreviations used in the measurements of the adults are SVL (snout-vent length), HL (head length), HW (head width), ED (eye diameter), IOD (interorbital distance), THL (thigh length), TBL (tibia length), and FL (foot length). All measurements are in millimeters. The measurements of the adults followed Duellman (1970) and Cei (1980). Measured adult specimens were fixed in 10 % formalin and preserved in 70 % ethyl alcohol. The tadpoles were preserved in 5 % formalin. For measurements we used an ocular micrometer in a Zeiss stereomicroscope, except for SVL that was measured with a caliper. Drawings of the holotype and tadpole were made using a Zeiss stereomicroscope with a drawing tube. Tooth row formula of tadpoles is given according to Altig (1970).

Results

Physalaemus caete sp. nov.

Holotype. – MNRJ 9803, adult male (fig. 1), collected at Fazenda Santa Justina, Municipality of Passo de Camaragibe (approximately 9°13'S 35°31'W; 45-90 m elevation), State of Alagoas, Brazil, on 26-30 June 1988 by Dante M. Teixeira.

Paratopotypes. – MNRJ 9801-02, 9804-05, 9848-50, adult males, collected with the holotype.

Diagnosis. – A medium-sized species (males 23.3-25.8 mm SVL) belonging to the *Physalaemus signifer* group (sensu Lynch, 1970), characterized by: (1) short and wide head; (2) snout nearly rounded in dorsal view and protruding in lateral view; (3) canthus rostralis weakly distinct; (4) dorsolateral light fold extending from the posterior corner of the eye to the inguinal region; (5) two or three black spots on the tibia; (6) large outer metatarsal tubercle.

Physalaemus caete is distinguished from *P. olfersii* by its smaller size (*P. olfersii* 28.5-34.5 mm SVL; Heyer et al., 1990) and by the presence of dark inverted V-shaped marks on the back (absent in *P. olfersii*). By its larger size, the new species differs from *P. bokermanni*, *P. crombiei*, *P. maculiventris*, *P. nanus*, *P. signifer* and *P. spiniger* (combined SVL ranging 15.0-22.3 mm; Bokermann, 1962; Cardoso & Haddad, 1985; Heyer & Wolf, 1989; Heyer et al., 1990; Haddad & Pombal, in press; personal observations). Further, the new species differs from *P. crombiei*, *P. maculiventris* and *P. signifer* by its broader head. From *P.*

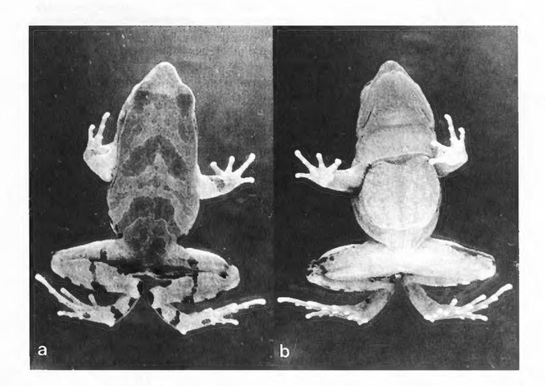


Fig. 1. – *Physalaemus caete*, holotype MNRJ 9803. (a) Dorsal view; (b) ventral view.

bokermanni and *P. signifer*, *P. caete* also differs in having a snout protruding in lateral view (see *P. signifer* and *P. bokermanni* figures in BOKERMANN, 1962 and CARDOSO & HADDAD, 1985, respectively). *Physalaemus caete* is distinguished from *P. maculiventris* and *P. moreirae* by its relatively uniformly colored belly (boldly dark and light mottled posterior belly in *P. moreirae* and *P. maculiventris*; HEYER, 1985; personal observations). From *P. obtectus*, *P. caete* is distinguished by its larger outer metatarsal tubercle and its smaller head (in *P. obtectus* head length 31-32 % SVL, in *P. caete* head length 22-24 % SVL).

Description of holotype. – Body nearly slender; head wider than long; snout nearly rounded in dorsal view, protruding in lateral view (fig. 2a-b); nostrils slightly protuberant, directed laterally; canthus rostralis weakly distinct; eye slightly protuberant; tympanum weakly distinct, large; distinct supratympanic fold from tympanum to shoulder; narrow dorsolateral fold extending from the posterior corner of the eye to the inguinal region; vocal sac distinct, subgular, slightly expanded externally, extending to the border of chest with belly; vocal slits present; choanae large, nearly round; tongue narrow, long; vomerine teeth absent; maxillary teeth not visible, but discernible by probe. Arms slender, forearms moderately robust; fingers short, no prepollex; brown nuptial pad on each thumb; subarticular tubercles single, protrud-

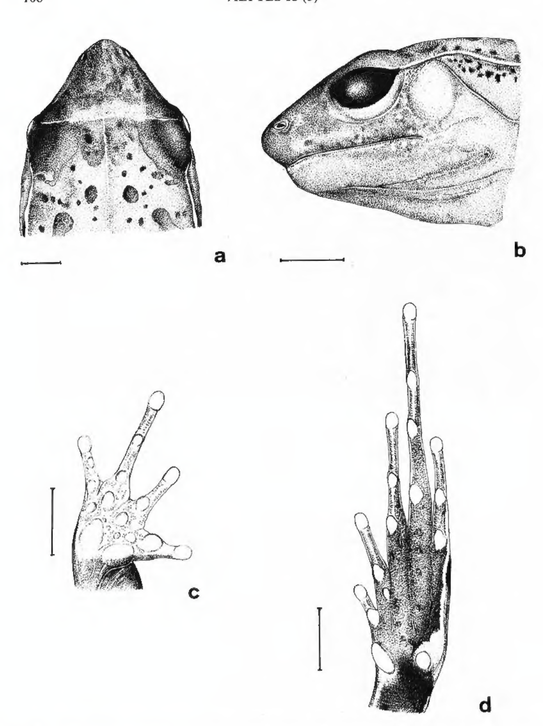


Fig. 2. – *Physalaemus caete*, holotype, MNRJ 9803. (a) Dorsal and (b) lateral views of head; ventral views of (c) hand and (d) foot (scale = 2 mm).

ing and round; outer metacarpal tubercle large, ovoid; inner metacarpal tubercle large, nearly elliptical; small supranumerary tubercles; finger tips slightly expanded; finger lengths I = IV < II < III (fig. 2c). Legs moderately robust; tibia length longer than thigh length; foot with a protruding, elliptical inner metatarsal tubercle; outer metatarsal tubercle small, protruding and round; well-developed subarticular tubercles, single, protruding and round; small supranumerary tubercles; toe tips slightly expanded; toe lengths I < II < V < III < IV (fig. 2d). Inguinal glands small; dorsum skin and venter smooth.

Color of holotype. – In preservative, dorsum brown with three dark brown inverse V-shaped marks with a fine light border, and also with dark brown dots with a fine light border; a white line on the dorsolateral fold; flanks below the dorsolateral fold dark brown; inguinal gland with a black spot on its right side and three black spots on the left side; forearm light brown with a dark brown transverse bar; a dark brown spot below the elbow; thigh, tibia and foot light brown; thigh and tibia with a dark brown transverse bar, foot with a dark brown spot; black marks on the knee and upperparts of thigh; three black spots on the tibia and tarsus; posterior tarsus and anal region black; sole of foot gray; palm cream; throat dark gray; belly gray with small light gray dots.

In life, the inguinal region was orange-reddish (D. M. TEIXEIRA, personal communication).

Measurements of the holotype. – SVL 24.5; HL 5.3; HW 8.7; ED 2.8; IOD 4.2; THL 11.2; TBL 12.3; FL 11.7.

Variation. – In preservative, dorsum brown to dark brown; in some specimens the dorsal pattern is less evident or without the fine light borders of the inverse V-shaped marks; in one individual the dorsum is rugose; inguinal glands well or poorly developed; the black spots on the inguinal glands are distinct in all individuals, but sometimes are small. Measurements (mean ± standard deviation, range) of seven males (females unknown) are as follows: SVL 24.54 ± 0.85, 23.5-25.8; HL 5.74 ± 0.40, 5.3-6.2; HW 9.10 ± 0.44, 8.5-9.6; ED 2.67 ± 0.17, 2.4-2.0; IOD 4.26 ± 0.20, 4.0-4.6; THL 11.93 ± 0.64, 11.2-12.7; TBL 12.31 ± 0.21, 12.0-12.6; FL 11.64 ± 0.41, 11.0-12.2.

Tadpoles. – A foam nest where males of *P. caete* were in calling activity was found in the type locality. Larvae were obtained by development of the eggs of this nest (D. M. TEIXEIRA, personal communication). The following description is based on a tadpole in developmental stage 28 (GOSNER, 1960). Body depressed-globular in lateral view (fig. 3a), ovoid in dorsal and ventral views (fig. 3b-c); body wider than high; snout rounded; eyes small, dorsolateral; nostrils dorsal, small and rounded, about midway between the eyes and the tip of snout; spiracle sinistral, its opening past middle of body; cloacal tube median, medium sized; caudal musculature slender; dorsal fin originating on body; ventral fin wider than dorsal. Oral disc (fig. 3d) directed ventrally and bordered by papillae, with a large gap on the anterior labium; tooth row formula 2(2)/3(1); jaw sheath strongly developed and serrate; posterior sheath V-shaped. In preservative, body gray; caudal musculature with scattered melanophores, concentrated on the upper first third; fins translucent with scattered melanophores.

Measurements: total length 14.9; body length 8.9; body heigth 2.4; body width 3.7; internarial distance 0.4; interorbital distance 1.0; eye-nostril distance 0.5; eye diameter 0.5.

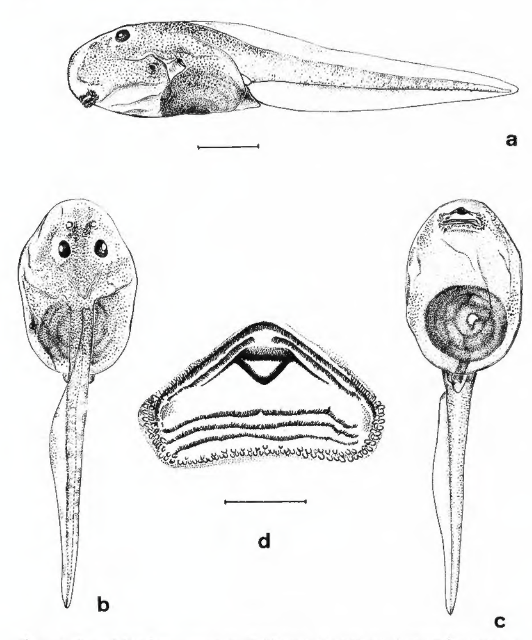


Fig. 3. – Tadpole of *Physalaemus caete*, stage 28; (a) lateral, (b) dorsal and (c) ventral views (scale = 2 mm); (d) oral disc (scale = 0. 5 mm).

Distribution. – The new species is known only from the type locality, and from the municipality of Murici (approximately 9°47'S 36°50'W; 650 m elevation), both in the State of Alagoas, northeastern of Brazil. The other species of the *Physalaemus signifer* group are known from the States of Rio Grande do Sul to Espírito Santo (Frost, 1985; Duellman, 1993). The new species represents the northernmost record for the *P. signifer* group.

Natural history. – *Physalaemus caete* was collected by day on the leaf litter around ponds in the Atlantic Rain Forest. The eggs, in foam nests, were observed in the water of ponds and in the water of tree holes, near the ground.

Etymology. – *Caetê* is a Tupi indigenous name, here used as a noun in apposition. The specific name is an allusion for the forest habitat (*caá*, forest; *etê*, true), where *P. caete* and most of the species of the *P. signifer* group are collected. *Caeté* was also the name of the extinct Indians from the region of the type locality.

RÉSUMÉ

Une nouvelle espèce de grenouille leptodactyle est décrite de Passo de Camaragibe, commune de l'état de Alagoas, nord-est du Brésil. La nouvelle espèce, qui appartient au groupe de *Physalaemus signifer*, est caractérisée par sa taille moyenne, son museau proéminent en vue latérale, ses plis dorsolatéraux clairs s'étendant de l'extrémité postérieure de l'oeil jusqu'à la région inguinale, et son tubercule métatarsien externe développé. Une description du têtard est fournie.

ACKNOWLEDGMENTS

Dante M. TEIXEIRA collected the new species and provided valuable information; U. CARAMASCHI and C. F. B. HADDAD made helpful suggestions on the manuscript; P. R. NASCIMENTO made the line drawings; U. CARAMASCHI made the photos of the holotype; H. ZAHER translated the résumé; C. F. B. HADDAD and I. SAZIMA loaned and/or permitted study of material under their care.

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Appendix 1

Additional specimens examined

Physalaemus caete. – MNRJ 9712-17 (Murici, AL); MNRJ 18280 (lot of tadpoles, Passo de Camaragibe, AL).

Physalaemus bokermanni. – ZUEC 4520-21 (paratypes, Santo André, SP).

Physalaemus crombiei. – MNRJ 17694-745 (Aracruz, ES).

Physalaemus maculiventris. – AL-MN 684 (syntype, "Alto da Serra de Cubatão"); MNRJ 4228-30 (Paranapiacaba, SP); MNRJ 1797, 9975-10020 (Serra de Araraquara, PR).

Physalaemus moreirae. – MNRJ 464 (holotype, Paranapiacaba, Santos, SP).

Physalaemus nanus. – CFBH 081 (Sao José, SC); MNRJ 12827-32 (Florianópolis, SC).

Physalaemus obtectus. – MNRJ 4025, 14206-07 (paratypes, Linhares, ES).

Physalaemus olfersii. – MNRJ 2428 (Parati, RJ); MNRJ 0482, 5525-26, 12826 (Teresópolis, RJ).

Physalaemus signifer. – MNRJ 1123, 6616-35 (Duque de Caxias, RJ); MNRJ 2753, 12461-62 (Barro Branco, Duque de Caxias, RJ); MNRJ 2766, 12477-80 (Pendotiba, Niterói, RJ); MNRJ 12837-42 (topotypes, Jacarepaguá, Rio de Janeiro, RJ).

Physalaemus spiniger. – CFBH 312-17, 319-21, MNRJ 18474, ZUEC 6878, 6881-82 (Cananéia, SP); ZUEC 9333-43 (Caraguatatuba, SP); CFBH 2479 (Eldorado, SP); MNRJ 18475-76 (Guaraqueçaba, PR); CFBH 307-10, 410, 835, MNRJ 18470-72, 18473, ZUEC 6876-77 (topotypes, Iguape, SP); ZUEC 3250 (Jacupiranga, SP).

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Un nuevo *Leptodactylus* (Anura, Leptodactylidae) de un bosque nublado del oeste de Venezuela

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A new species of the frog genus *Leptodactylus* is described from Cerro Socopó, Municipio Mauroa, State of Falcón, western Venezuela. This species is tentatively included in the *L. podicipinus-wagneri* complex of species. It can be distinguished from other members of this complex in lacking dorsolateral folds, and in having males with subovoid snout tip, females with snout tip rounded to almost truncated, and light posterior lip stripe visible and well defined.

Introducción

Las ranas silbadoras del género *Leptodactylus* están ricamente representadas y ampliamente distribuidas en Venezuela, con 18 especies registradas por La Marca (1992). Luego de la revisión de Heyer (1994) del complejo de especies de *L. podicipinus-wagneri*, se eleva el número de especies del género a 26. En este último trabajo, el autor examinó numerosos ejemplares asignables a este complejo de especies, muchos de ellos provenientes de una amplia lista de localidades en Venezuela (la mayoría a elevaciones entre 850 y 1900 m de altitud), entre las cuales se menciona al Estado Falcón, sin señalar una localidad específica, y comenta que "Within Venezuela, there are clusters of specimens from three small geographic areas that appear to represent distinct OTUs" (Heyer, 1994: 46). Uno de estos ejemplares proviene de la siguiente localidad: "Falcón: Carora, 84 km NW of, Cerro Socopó, 1260 m, USNM 216804".

Durante un trabajo de campo realizado por el autor en el Cerro Socopó, Estado Falcón, se encontraron siete ejemplares de *Leptodactylus* sin pliegues dorsolaterales evidentes, y los machos con un par de espinas queratinizadas en el pulgar de cada mano. Una vez comparados con las reseñas publicadas por Heyer (1994) y con ejemplares provenientes de Mérida, Andes de Venezuela, y las tierras bajas de la región del sur del Lago de Maracaibo, se evidenció que estos ejemplares representan una especie aun no descrita.

Materiales y métodos

La terminología y las medidas son una combinación a conveniencia de las propuestas de Rivero (1961) y Heyer (1994). El registro de la fórmula de membranación pedal sigue la metodología sugerida por La Marca (1994). Las medidas se presentan para todos los ejemplares en la tab. 1. Los criterios para determinar la condición adulta y la clase de tamaño de los ejemplares son los mismos empleados por Heyer (1994). Las siguientes abreviaciones son utilizadas para designar las colecciones: AMU, números de campo de Abraham Mijares-Urrutia; CIEZAH, Colección Herpetológica del Centro de Investigaciones en Ecología y Zonas Áridas, Universidad Francisco de Miranda, Venezuela; EBRG, Estación Biológica de Rancho Grande, Maracay, Venezuela; ULABG, Colección de Anfibios y Reptiles del Laboratorio de Biogeografía, Universidad de Los Andes, Mérida, Venezuela; USNM, National Museum of Natural History, Washington, Estados Unidos.

Resultados

Leptodactylus magistris sp. nov.

(fig. 1)

Holotipo. – EBRG 3284 (AMU 2704), macho, proveniente del Cerro Socopó, cerca de 30 km (por carretera) al SO de Guajiro, Municipio Mauroa, Estado Falcón, Venezuela, cerca de 1250 m, colectado por Abraham Mijares-Urrutia, Leo Yagua y Domingo Daal, el 8 de Febrero de 1996.

Paratopotipos. – EBRG 3285 (AMU 2706), hembra, ULABG 4112 (AMU 2702), macho, y ULABG 4113-4114 (AMU 2701 y 2705), hembras, mismos datos que el holotipo.

Ejemplares referidos. – USNM 216804, [Estado] Falcón, Cerro Socopó, 84 km. NW of Carora, 1260 m; CIEZAH 385 (AMU 2700), hembra, mismos datos que el holotipo.

Diagnosis. – Heyer (1994) caracteriza, aunque con cierta reserva, el complejo de especies de *Leptodactylus podicipinus-wagneri* por la ausencia de pliegues o en el mejor de los casos con un par de pliegues dorsolaterales. Partiendo de esta definición, *Leptodactylus magistris* se incluye tentativamente como miembro de este complejo de especies. Esta nueva especie se distingue de las especies incluidas por Heyer (1994) dentro del complejo *podicipinus-wagneri* por la siguiente combinación de características: (1) hocico subovoide en vista dorsal; (2) longitud de los dedos manuales I = II = IV < III; (3) cresta ulnar insinuada por una línea de espículas dispuestas laxamente; (4) piel dorsal con diminutas espículas terminadas en puntas queratinizadas; (5) pliegues dorsolaterales ausentes; (6) disco ventral ausente; (7) espinas pectorales ausentes; (8) puntas de los dedos manuales no dilatadas; (9) dos espinas grandes, puntiagudas, queratinizadas en cada dedo pulgar manual, (10) brazos moderadamente hipertrofiados; (11) dedos manuales con rebordes presentes en los dedos II y III; (12) línea labial clara con bordes bien definidos y extendiéndose hasta por debajo del tímpano; (13) pliegue tarsal débil, con espículas presentes a lo largo de la cresta del pliegue; (14) planta de las patas traseras con diminutas espículas queratinizadas.

Tab. 1. - Medidas (en mm) de los ejemplares holotipo y paratopotipos de *Leptodactylus magistris* LRC, longitud rostro-cloacal; LCB, longitud cabeza; ACB, ancho cabeza; *n*, número de ejemplares.

	Hembras (*n* = 4)		Machos (*n* = 2)	
	Media ± desviación estándar	Ámbito de variación	Media ± desviación estándar	Ámbito de variación
LRC	38.6 ± 7.55	27.9-45.1	39 05 ± 0 07	39 0-39 1
ACB	13.6 ± 1.13	12.8-14.9	11 55 ± 0 21	11.4-11.7
LCB	15.1 ± 1.27	14.4-16 6	13.15 ± 0.07	13.1-13.2
Fémur	19.2 ± 1.13	18.4-20.5	17.9 ± 0.14	17.8-18.0
Tibia	20 4 ± 1 08	19.5-21.6	18.35 ± 0.63	17.9-18.8
Pie	23.2 ± 0 98	22.6-24.4	20.55 ± 1.62	19.4-21.7
Tímpano	2 9 ± 0 32	2.7-3.3	2.8 ± 0 14	2.7-2.9

De las especies del complejo de *Leptodactylus podicipinus-wagneri* registradas por HEYER (1994) en Venezuela y norte de Colombia, *L. magistris* se diferencia de *L. colombiensis*, *leptodactyloides*, *nesiotus*, *pallidirostris*, *petersii*, *sabanensis* y *validus* por tener todas ellas pliegues dorsolaterales presentes (ausentes en *L. magistris*) La única especie sin pliegues dorsolaterales, *L. diedrus*, se diferencia de *L. magistris* por tener la punta del hocico redondeado (subovoide en *magistris*) y la línea clara postero-labial indistinta o no discernible (visible, con bordes superior e inferior bien definidos, en *magistris*).

Descripción del holotipo. – Cabeza ligeramente más ancha que larga; espacio interorbital liso, ligeramente convexo; distancia interorbital 2 0 veces mayor que la anchura del párpado superior; canto rostral no muy bien definido; región loreal ligeramente cóncava, inclinada; labios no ensanchados; narinas elevadas, dirigidas lateralmente y ligeramente hacia atrás; narinas más cerca de la punta del hocico que del borde anterior del ojo; hocico subovoide en vista dorsal; punta del hocico redondeado en vista dorsal, subovoide en vista lateral; diámetro del ojo ligeramente inferior a la distancia ojo-narina; distancia internarinal casi igual a la distancia ojo-narina; tímpano bien visible, con bordes ligeramente elevados, parcialmente queratinizados; tímpano separado del ojo algo más de 1.8 veces su diámetro horizontal; pliegue supratimpánico presente, apenas cubriendo una pequeña porción del margen superior

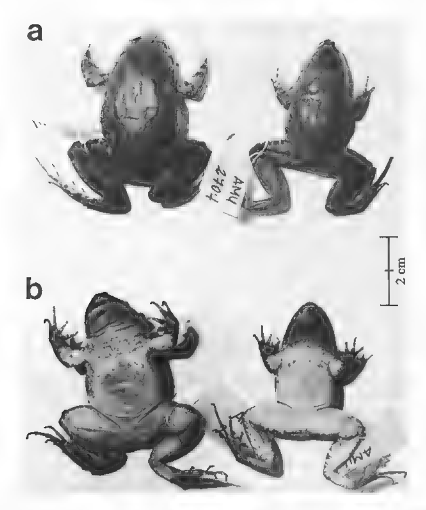


Fig. 1. (a) Vista dorsal de la hembra (izquierda, paratopotipo EBRG 3284) y del macho (derecha, holotipo EBRG 3285), y (b) vista ventral con igual orden de *Leptodactylus magistris*.

del tímpano; lengua más larga que ancha, 1/3 posterior no adherido al piso de la boca, coanas redondeadas, no cubiertas por repliegue palatal del arco maxilar; dientes vomerianos presentes, dispuestos moderadamente por detrás y entre las coanas, alineados uno al lado del otro; maxilar y premaxilar dentados.

Dorso liso con numerosas espículas queratinizadas, diminutas, extremo posterior del dorso ligeramente tuberculado; pliegues dorsales y dorsolaterales ausentes; vientre finamente rugoso; piel del pecho y de la garganta lisa; brazo y antebrazo igual que el dorso; una línea conspicua de espículas recorriendo a lo largo el borde ventrolateral del brazo y antebrazo; tubérculo ténar ausente, tubérculo palmar entre redondeado y ligeramente cordiforme, con bordes inconspicuos; tubérculos supernumerarios ausentes; tubérculos subarticulares grandes, muy elevados, redondeados vistos desde arriba, ovalados en vista lateral; puntas de los

dedos no terminadas en almohadillas; última falange homogéneamente ancha en toda su longitud; dedos manuales libres; rebordes carnosos presentes en los dedos II y III, reborde algo más pequeño presente del lado interno de los dedos I y IV; primer dedo de igual longitud que el segundo, cada pulgar con un par de espinas queratinizadas, negras; espinas subiguales, tamaño moderadamente grande; brazos moderadamente hipertrofiados.

Abertura cloacal a nivel de la línea media de los muslos, dirigida posteroventralmente, cubierta por un pliegue corto, con borde crenulado; abertura cloacal rodeada por estrías relativamente profundas y anchas, dando un aspecto radiado a la región cloacal; piel de los muslos, pantorrillas y tarsos moderadamente rugosa, con numerosas espículas dorsalmente, lisa ventralmente; pliegue tarsal presente, semejante a una quilla, con numerosas espículas sobre y a lo largo del pliegue; pliegue tarsal se extiende desde la base del tubérculo metatársico interno hasta casi 2/3 del tarso, haciendo un recorriendo ligeramente oblícuo; tubérculo metatársico externo casi cuadrado, elevado, subcónico en vista lateral; tubérculo metatársico interno muy alargado, casi 2.8 veces más largo que ancho, cerca del doble del tamaño del tubérculo externo; tubérculos supernumerarios ausentes; espículas presentes en la palma de la pata, numerosas; tubérculos subarticulares grandes, entre redondeados y ovalados vistos desde arriba, elevados, entre ovoides y subcónicos en vista lateral; dedos pedales con palmeadura basal, fórmula de la palmeadura varia entre la pata derecha y la izquierda: I 1.0 – 1.0 II 1.0 – (0.5-1.0) III 0.5 – 1.0 IV (0.5-1.0) (1.0-1 0^{+}) V; dedos pedales con pliegues carnosos bien desarrollados; un reborde visible a lo largo del margen externo del quinto dedo, desde la punta hasta la base del primer tubérculo subarticular; extremo distal de los dedos pedales de igual ancho que la falange adyacente; talones se superponen cuando los muslos son colocados en línea recta respecto al eje longitudinal del cuerpo; talón alcanza entre el tímpano y el ojo cuando las patas traseras son extendidas hacia adelante.

Coloración en vida (datos tomados en el campo, incluyendo variación individual). Castaño muy oscuro dorsalmente con algunas manchas castaño negrusco redondeadas (aspecto "leopardino") Dorso de muslos, tibias y tarsos de igual color con bandas negras transversales, unas bien definidas y otras algo difusas, intercaladas unas con otras; miembro anterior dorsalmente igual que posteriores. Vientre crema con algunas manchas pardas que se hacen más densas anteriormente formando une "red" que puede extenderse sobre el pecho y parte posterior de la garganta; región gular entre castaño y castaño oscuro, con manchas blancas; labio inferior castaño oscuro con manchas blancas, labio superior con bandas castaño oscuro (dos lacrimales, una postero-ocular) y dorado castaño (en la punta del hocico); banda interocular castaño dorado con bordes negros. Pupila negra, redondeada, iris castaño pálido no reticulado.

Coloración en preservativo del holotipo. – Dorso castaño oscuro sin manchas evidentes; cara dorsal de los brazos, muslos, tibias y tarsos con bandas transversales negras; banda interocular clara algo difusa, cabeza lateralmente con dos líneas blancas bien definidas (una desde el borde posterior del ojo hasta la comisura de la boca y otra desde el borde inferior del ojo hasta el borde del labio superior) y otras líneas claras, indistintas, en la región loreal y la punta del hocico. Labio inferior castaño oscuro con lunares pequeños, blancos; garganta castaño oscuro sin manchas, ligeramente más pálido que en el labio inferior; pecho crema-castaño inmaculado; mitad anterior del vientre crema con manchas y líneas irregulares castaño pálido, formando una suerte de entramado laxo; mitad posterior del vientre y cara

ventral de los muslos crema inmaculado. Cara posterior de los muslos castaño oscuro con una línea clara, oblícua desde algo lateralmente a la región cloacal hasta un poco antes de alcanzar la coyuntura tibio-femoral conectando con el color crema ventral.

Medidas (en mm) del holotipo. – Longitud rostro-cloacal 39.0; longitud cabeza 11.4; ancho cabeza 13.2, fémur 17.8; tibia 17 9; tímpano 2.9; longitud ojo-punta hocico 6.6; longitud ojo-narina 3.6; diámetro horizontal del ojo 3.1; distancia interorbital 4.1; distancia internarinal 3.3; ancho párpado superior 2.1; pata posterior 19.4. Las medidas de los restantes ejemplares paratopotipos aparecen en la tab. 1.

Variaciones. Los restantes cinco ejemplares paratopotipos, cuatro hembras y un macho, todos adultos, mostraron una apariencia general muy homogénea entre sí y con el ejemplar holotipo Todos los animales exhiben la línea pálida postero-labial bien visible y definidos sus bordes, labio inferior pardo oscuro con manchas redondeadas blancas, región gular castaño más pálido, extendiéndose hasta el pecho y porción anterior del vientre, observándose en esta parte (y, ocasionalmente, también en el pecho) un marmoreado con manchas blancuzcas; no se insinúan pliegues dorsolaterales. Se detectaron diferencias exclusivamente en las siguientes características: el primer dedo manual en las hembras siempre es visiblemente más largo que el segundo (en los dos machos adultos son iguales); una hembra (EBRG 3285) tiene la punta del hocico casi truncado (en vista dorsal) y el labio inferior no muestra el patrón descrito anteriormente, sino más bien crema pálido; las hembras no muestran el brazo hipertrofiado como los machos.

Historia natural y distribución. – *Leptodactylus magistris* fue colectado en el remanso de una pequeña quebrada, al lado de un camino de tierra. Los ejemplares fueron colectados en un área relativamente abierta y con abundantes plantas herbáceas y arbustos muy pequeños pero densos, dentro de una sucesión secundaria de bosque nublado. En ese momento, aproximadamente las 16.30 h, se escucharon cantos de este especie desde dentro del agua y entre las densas hierbas y arbustos en la orilla del remanso. También se observaron varios nidos de espuma dispuestos en la orilla, generalmente disimulados bajo grupos moderadamente espesos de hierbas, o asociados a rocas semi-sumergidas rodeadas o cubiertas con alguna vegetación Se colectó un ejemplar pequeño, presuntamente juvenil (CIEZAH 386, longitud rostro-cloacal 18.7 mm). No se observaron parejas en amplexo; sin embargo, se encontraron dos renacuajos pardo oscuros (posteriormente perdidos), similares a los ya descritos para especies de este grupo de especies (Maxson & Heyer, 1988; Heyer, 1994). De los ejemplares examinados, una sola hembra (EBRG 3285) tenía la cavidad abdominal llena de huevos maduros en los oviductos, de tamaño moderado (1.1-1.4 mm de diámetro), bicoloreados (negro-blanco), redondeados, frecuentemente con algunos lados achatados; las restantes tres hembras adultas mostraron los oviductos convolutos, llenos de huevos diminutos (inmaduros), blancos. Ambos machos adultos presentan los cuerpos grasos bastante voluminosos (casi llenan toda la cavidad abdominal), e igualmente un buen desarrollo del par de espinas del primer dedo manual y las hendiduras vocales (vocal slits) bien evidentes y completamente abiertas.

En la misma localidad se encontraron un adulto de *Hyla crepitans*, activa a esa hora del día, y adultos de *Mannophryne* sp., con machos cantando Estos últimos no se encontraban junto con los *Leptodactylus*, sino algo más retirados del borde del camino, en una área de vegetación algo más densa.

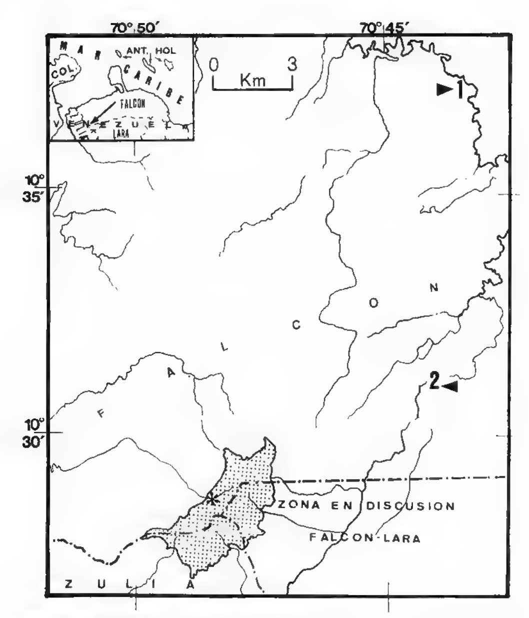


Fig. 2. · Mapa mostrando la localidad aproximada (asterisco) de colecta de los ejemplares de la serie típica de *Leptodactylus magistris*, en Cerro Socopó, Estado Falcón, Venezuela El área punteada representa la cota de 1200 m Los numeros señalados por triángulos indican los poblados de (1) Guajiro, y (2) Rancho Lara COL, Colombia, ANT. HOL , Antillas Holandesas.

Hasta el presente, *Leptodactylus magistris* se conoce exclusivamente de la localidad típica (fig 2). Sin embargo, no se descarta su presencia en sectores más bajos de Cerro Socopó y en montañas vecinas como Cerro Azul (cerca 1880 m) y Cerro Cerrón (cerca 2080 m) que, junto con Cerro Socopó, constituyen la Serranía de Ziruma. Estas montañas están conectadas por

valles relativamente altos (más de 500 m), con condiciones climáticas, tipo y densidad de cobertura vegetal y disponibilidad de agua comparables (Robert WINGFIELD, comunicación personal).

Etimología. – El epíteto específico en latín *magistris* (nombre plural del modo dativo, significando "a [mis] maestros") hace honor a mis tres profesores: Pascual SORIANO, Enrique LA MARCA y Alexis ARENDS, cuya generosa amistad, paciente guía, y oportunos consejos me han inspirado y permitido avanzar para alcanzar metas profesionales y personales que parecían imposibles. A ellos, mi muy sentido agradecimiento.

RESUMEN

Se describe una nueva especie de rana silbadora del género *Leptodactylus*, *L. magistris*, proveniente del Cerro Socopó, cerca 30 km. (por carretera) al SO de Guajiro, Municipio Mauroa, Estado Falcón, oeste de Venezuela. Esta especie, tentativamente considerada miembro del complejo de especies de *L. podicipinus-wagneri*, se distingue de los miembros de esta agrupación por la ausencia de pliegues dorsolaterales, la punta del hocico subovoide en los machos y redondeada-semitruncada en las hembras, y una línea pálida postero-labial visible y bien definida

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The tadpole of *Atelognathus nitoi* (Leptodactylidae, Telmatobiinae)

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The tadpole of *Atelognathus nitoi* is described. Tadpoles of this isolated species, endemic to the Nahuel Huapi National Park (Argentinian Patagonia), show the basic characteristics of the described tadpoles in the genus: *A. patagonicus* and *A. reverberii*. Tadpoles of *A. nitoi* are more similar in their external features and proportions to the tadpoles of *A. patagonicus* but are easily distinguishable from both species by having a broadly rounded tip of the tail and a smaller lateral emargination of the oral disc. Further differences with *A. reverberii* are the smaller size, the more slender body and the smaller oral disc.

Introduction

The genus *Atelognathus* consists of seven endemic species with small ranges in Patagonia (southern South America). These species are mainly distributed around basaltic lagoons of the extra Andean highlands in the provinces of Neuquén (*A patagonicus*, *A praebasalticus*), Río Negro (*A reverberii*, *A. solitarius*) and Chubut (*A. salai*) in Argentina, between 38°40′ and 46°10′S, and in the Magellanic moorlands of Wellington Island (*A. grandisonae*) in southern Chile, at about 49°S (Cei, 1984). *Atelognathus nitoi* inhabits a different habitat near a small Andean lagoon surrounded by the deciduous temperate forest of *Nothofagus pumilio* in western region of Río Negro Province.

Only the tadpoles of *A patagonicus* and *A reverberii* have been described. These nongregarious, free-swimming tadpoles of shallow waters have a typical leptodactylid appearance. Tadpoles of *A. reverberii* are larger and stouter than are those of *A patagonicus* (Cei, 1965, 1969)

While conducting field work in December 1995 and March 1996 at the type locality of *A. nitoi* (Barrio, 1973), we collected tadpoles of this poorly known species. The description of these tadpoles is here provided.

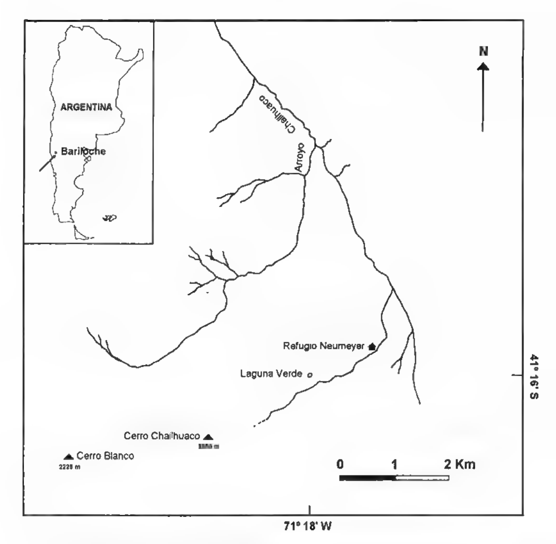


Fig. 1. – Location of Laguna Verde, type locality of *Atelognathus nitoi*, in the Parque Nacional Nahuel Huapi, Río Negro Province, Argentina. Triangle represents the peak of Cerro Challhuaco and house symbol represents Neumeyer refuge.

Material and methods

Tadpoles of *Atelognathus nitoi* were collected at the type locality: Laguna Verde, a small lagoon on Cerro Challhuaco, Nahuel Huapi National Park, Río Negro Province, Argentina (41°16'S, 71°18' W, ca. 1550 m of elevation), the only known locality of the species (fig. 1). Geographic coordinates were obtained with a Garmin 45 Global Positioning System (GPS).

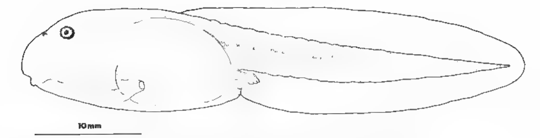


Fig. 2. Lateral view of a tadpole of *Atelognathus nitoi* (MACN 36695, stage 34)

Tadpoles deposited at Museo de La Plata (MLP A.1223) were collected on 10 December 1995 at developmental stages 25-28 (GOSNER, 1960) Some tadpoles were raised in the laboratory and fixed at various stages of development Three tadpoles were allowed to complete metamorphosis in order to verify their specific identification. A tadpole deposited at Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN 36695) was collected on 2 March 1996 at stage 34 All tadpoles were fixed in 10 % neutral formalin. Measurements were taken with a dial caliper to the nearest 0 05 mm Drawings were made with a camera lucida attached to a Wild M-5 stereoscopic microscope Terminology follows ALTIG (1970), ALTIG & JOHNSTON (1989), DUBOIS (1995) and VAN DIJK (1966).

Specimens examined for comparisons included *A. patagonicus* (MLP A.1222; 3 specimens) and *A. reverberii* (MACN 28467-68; 2 specimens).

DESCRIPTION OF TADPOLES OF *ATELOGNATHUS NITOI* (fig. 2-3)

Type IV tadpoles (ORTON, 1953). Total length of largest specimen of the series (stage 40), 56.45 mm; smallest tadpole (stage 25), 15.1 mm (tab 1). Total length at stage 34 (MACN 36695), 47 35 mm; body length about two-fifths of total length, almost twice body width; body shape oval, somewhat depressed, 1.2 times wider than high; snout rounded in dorsal and lateral profile; eyes large, dorsolateral; interorbital distance twice eye diameter; nostrils dorsal, protuberant, closer to eye than snout; distance between nostrils equal to their distance from eyes and three-fifths of interorbital distance; spiracle sinistral, opening directed posterolaterally; vent tube short; vent opening dextral, lying dorsal to a fold in ventral fin; caudal musculature moderately robust anteriorly, becoming narrower gradually toward tip of tail; dorsal and ventral fins equally developed, higher than musculature at midlength; dorsal fin extending slightly onto body; tip of tail rounded.

Oral disc anteroventral, slightly wider than interorbital distance, about 40 % of body width; one row of small regular marginal papillae, with wide medial gap on upper labium (fig. 3); disc emarginate, lateral margin with small, but distinct constrictions; intramarginal lateral papillae present in infra- and supraangular regions; tooth row formula $2[A_2]/3[P_1]$; upper rows as long as upper sheath; third lower row slightly shorter than second lower row; jaw sheaths thin, gently curved and finely serrate.

Tab. 1. - Measurements (mm, mean ± standard deviation) of tadpoles of *Atelognathus nitoi*. Those marked with an asterix (*) were raised in the laboratory from tadpoles collected at stages 25-28. *n*: sample size

Stage	*n*	Body length	Total length
25	5	7.28 ± 0.54	15.76 ± 1.20
26	12	8.22 ± 0.48	17.74 ± 0.91
27	11	9 64 ± 0.40	20.54 ± 0.86
28	4	10.54 ± 0.50	22.76 ± 2.68
31*	1	14.05	39.50
34	1	21.75	47.35
35*	5	17.62 ± 1.08	42.99 ± 1.29
36*	2	21 42 ± 0.25	51.32 ± 2.37
38*	1	22.25	54.65
40*	3	22 63 ± 0.47	54.62 ± 2.33

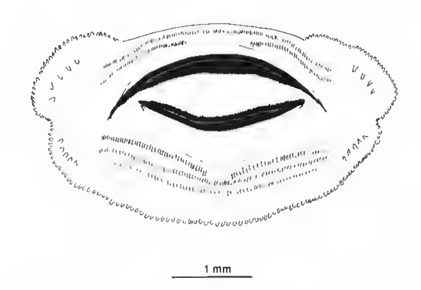


Fig 3. Oral disc of a tadpole of *Atelognathus nitoi* (MACN 36695, stage 34).

In life, dorsal color pattern of body golden-brown with bilateral unpigmented areas posterior to gills, giving the appearance of an indentation between head and body, caudal musculature golden-brown, caudal fins transparent with dark markings. In ventral view, intestine, heart, and cranial structures visible. In preserved specimens, densely crowded melanophores on the posterior body mark courses of blood vessels in tail musculature and fins.

DISCUSSION AND CONCLUSIONS

Tadpoles raised in the laboratory were maintained on a diet of Tetra Phill fish food. The tadpoles collected on 10 December 1995 and raised through metamorphosis in the laboratory reached stage 46 between 18 February and 11 March 1996.

The tadpoles collected at stages 25-28 were found at the littoral zone of the lagoon where they spent a considerable amount of time on the bottom in the shallow water. When disturbed, they swam individually about 1 m to a different location. The tadpole at stage 34 was found buried in the fine sediment on the bottom of the lagoon in 3 m of water. One adult female was found under a rotten tree-trunk near the pond margin on 10 December 1995.

The tadpoles of *A. nitoi* show the basic diagnostic characters listed by LAVILLA (1988) for the genus *Atelognathus* and can be classified in the ecomorphological guild Benthic (Section II.12) of ALTIG & JOHNSTON (1989).

Of the known tadpoles of the frog genus *Atelognathus*, tadpole of *A. nitoi* is most similar to that of *A. patagonicus* (CEI, 1965) from Laguna Blanca (Neuquén Province) than to that of *A. reverberii* (CEI, 1969) from Somuncurá Plateau (Río Negro Province). The tadpole of *A. nitoi* may be easily distinguished from *A. patagonicus* and *A. reverberii* by the broadly rounded tip of the tail and the smaller emargination of the oral disc. It differs further from the tadpole of *A. reverberii* by being smaller (*A. reverberii* grows to 98 mm total length; CEI, 1969), by having a slender oval body (*A. reverberii* has a stout and depressed body), and by having a smaller oral disc.

RESUMEN

Se describe la larva de *Atelognathus nitoi* en base a especímenes colectados en la localidad tipo de la especie. Laguna Verde, Cerro Challhuaco, Parque Nacional Nahuel Huapi, Provincia de Río Negro, Argentina. Las larvas de *A. nitoi* presentan las características típicas descriptas para el género. De las dos especies cuyos renacuajos se conocen, *A. nitoi* presenta larvas con una morfología mas similar a la larva de *A. patagonicus* que a la de *A. reverberii*. Las principales características externas diferenciales con *A. patagonicus* y *A. reverberii* son el extremo caudal notablemente redondeado y las emarginaciones laterales del disco oral menos pronunciadas. De *A. reverberii* se diferencia, además, por el menor tamaño general, el cuerpo menos deprimido y el disco oral relativamente mas chico.

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A redescription of *Ramanella mormorata* Rao, 1937 (Anura, Microhylidae)

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Ramanella mormorata **Rao, 1937, hitherto known only from the syntypes collected over half a century ago from "Saklespur, Hassan District, Mysore", at present in Karnataka State (south-western India), that are now lost, is redescribed, based on a new specimen from Cotigao Wildlife Sanctuary (Goa, south-western India), and an older one from "Malabar" in the collection of the Museum of Comparative Zoology. The species is compared with congeneric species from southern India and Sri Lanka.**

INTRODUCTION

The genus *Ramanella* was described by RAO and RAMANNA (1925), and named for the junior author, the type species (by monotypy) being *Ramanella symbioitca* Rao & Ramanna, 1925 (apparently a misprint for *Ramanella symbiotica*), a name considered a junior synonym of *Callula variegata* Stoliczka, 1872 by PARKER (1934: 93) and FROST (1985: 389) The genus, redefined by PARKER (1934), is restricted to peninsular India and Sri Lanka, and eight nominal species are currently recognized, five from India, two from Sri Lanka and one from both regions (see FROST, 1985: 389). Of these, perhaps the least known are three species from the Western Ghats of south-western India, *Ramanella anamalaiensis*, *Ramanella minor* and *Ramanella mormorata*, that are known only from the types described sixty years ago by RAO (1937) and then deposited in the Central College Museum in Bangalore. Since then, the whole collection of specimens described by RAO (1937) has been lost (see DUBOIS, 1984: 156-157). The present paper is devoted to one of these species, *R. mormorata*, the lost type specimens of which were stated to be from "Saklespur, Hassan District, Mysore" (currently spelt "Sakleshpur"; 12°59'N 75°43'E; at present in Karnataka State, south-western India).

When he prepared the original description of *Ramanella mormorata*, although the number of types was not specified, RAO (1937) clearly had several specimens of his new species, including "young specimens", "immature specimens", "mature males" and "mature females", but he presented measurements of a single specimen. As no holotype was desig-

nated in this original description, all these specimens must be considered syntypes of this species. RAO (1937: 420) stated that these specimens came from "whorls of the plantain leaves", and were usually found solitary, although occasionally two or three could be found together.

The purpose of this note is to report the rediscovery of *Ramanella mormorata*, based on material from Goa (India), a distance of over 300 km north-west of the type locality, and the discovery of an older specimen from "Malabar" in the collection of the Museum of Comparative Zoology (MCZ, Cambridge, USA). The species is redescribed and compared with the original description in RAO (1937).

One specimen (MCZ A.116283) was collected by the second author on 26-28 October 1994 from a forest rest house in Canacona (15°01'N 74°04'E), adjacent to Cotigao Wildlife Sanctuary (Goa, south-western India). This collection locality lies contiguous to a patch of wet evergreen forest, in a lowland situation. A second specimen (MCZ A 15421) was found in the MCZ collection with the locality "Malabar", which refers generally to the entire south-western highlands of India, also known as the Western Ghats.

MATERIAL AND METHODS

Measurements (to the nearest 0.1 mm) were taken with a Mitutoyo dial vernier calliper from specimens preserved in 70 % ethanol, over 12 months after collection in the case of MCZ A.116283. The following measurements were taken: SVL, snout-vent length (from tip of snout to vent), TBL, tibia length (distance between surface of knee and surface of heel, with both tibia and tarsus flexed), A-G, axilla to groin (distance between posterior edge of fore limb at its insertion to body and anterior edge of hindimb at its insertion to body); HL, head length (distance between angle of jaws and snout-tip); HW, head width (measured at angle of jaws); HD, head depth (greatest transverse depth of head, taken at the orbital region); ED, eye diameter (diameter of orbit); UE, upper eyelid width (greatest width of upper eyelid); IO, interorbital distance (least distance between upper eyelids); IN, internarial distance (distance between nostrils), E-S, eye to snout-tip distance (distance between anteriormost point of eye and snout-tip); E-N, eye to nostril distance (distance between anteriormost point of eye and nostril); and F2D, diameter of the disk on finger II.

DESCRIPTION

A small *Ramanella* (SVL up to 29.6 mm); habitus robust; body ovoid, with a thick waist (fig. 1-2); head short (HL/SVL ratio 0.20-0.24), broad (HW/SVL ratio 0.30-0.33); snout obtuse when viewed dorsally, truncate in lateral view, in level with the mandible, nostrils closer to tip of snout than to eyes (E-N/E-S ratio 0.54-0.56); canthus rostralis sloping; loreal region oblique; eyes large (ED/HL ratio 0.47-0 49), eye diameter greater than eye-nostril diameter (ED/E-N ratio 1.45-1 53); interorbital distance over two-and-half times greater than upper eyelid width (IO/UE ratio 2 27-3 07); distinct occipital fold (fig. 3), pupil vertical; supratympanic fold distinct, extending from posterior corner of upper eyelid to insertion of forelimb at

1.1 1.2

Fig. 1. - *Ramanella mormorata* from Canacona, near Cotigao Wildlife Sanctuary, Goa, south-western India (MCZ A.116283) in dorsal (1.1) and ventral (1.2) views. Bars: 10 mm

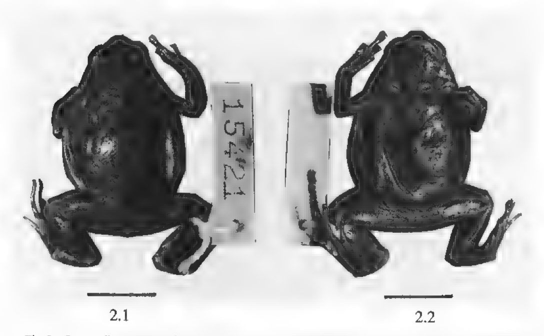


Fig. 2. - *Ramanella mormorata* from "Malabar", south-western India (MCZ A 15421) in dorsal (2.1) and ventral (2.2) views. Bars. 10 mm

Tab. 1. - Measurements (in mm) of *Ramanella mormorata* Rao, 1937 from south-western India (see text for details).

Measurements	MCZ A.15421	MCZ A.116283
Snout-vent length	29.6	25.9
Axilla-groin distance	13.4	11.0
Head length	5.9	6.2
Head width	9.0	8.6
Head depth	5.5	5.0
Eye diameter	2.9	2.9
Upper eyelid width	1.5	1.4
Interorbital distance	3.4	3.4
Internarial distance	1.8	2.4
Eye-snout-tip distance	3.7	3.4
Eye-nostril distance	2.0	1.9
Tibia length	11.7	10.8
Diameter of disk on finger II	1.2	1.2



Fig. 3. – Forehead of *Ramanella mormorata* (MCZ A.15421), showing the distinct occipital fold.

axilla; tympanum not externally visible, nostrils laterally oriented; inferior aspect of snout-tip smooth, without any nicks; inner margin of mandible with a distinct W-shaped notch; tongue large, smooth, without papillae, oval, measuring 6.2 mm in greatest length (in MCZ A.116283); post-choanal ridge well developed, with a broad median gap; cloacal opening directed posteriorly, slightly below the upper level of thighs.

Forelimbs long, the tips of fingers dilated into triangular, flattened disks, the largest on finger II (measuring 1.2 mm in both specimens examined), lacking webbing; two elongated metacarpal tubercles. Relative length of fingers: 3 > 4 > 2 > 1. Hindimbs relatively short; tibia short (TBL/SVL ratio 0.40-0.42); tibio-tarsal articulation failing to reach axilla; heels failing to overlap when the hindimbs are set at right angles to the body; tips of toes weakly swollen, but not dilated; toe webbing vestigeal, with three phalanges free on toe IV; a large elongated inner metatarsal tubercle and a smaller rounded outer metatarsal tubercle. Relative length of toes: 4 > 3 > 5 > 2 > 1. Measurements are given in tab. 1.

Skin with large, flattened pustules scattered throughout the dorsum, ventrum smooth.

In preservative, dorsum of MCZ A.116283 pale olive with dark brown bands behind the internarial, the interorbital and over the scapular region. Scattered dark brown blotches present on the rest of the dorsum; fore- and hindimbs dark-barred, the most distinctive bars being on the inguinal region, which is joined through the thighs to across the cloaca. Venter pale yellow, variegated with dark brown on the throat, chest, abdomen and the undersurfaces of the fore- and hindimbs. MCZ A.15421 is relatively more discoloured, but shows the dark blotches on the dorsum and the limb bands; the dark bands on the dorsum are broken up.

COMPARISONS

The present material matches the original description and illustrations of *Ramanella mormorata* by RAO (1937: 419-420, pl. 29 fig 19-19a) in the following characters: well developed post-choanal ridges, with a broad median gap; toes webbing weak; dorsum with dark blotches, in addition to dark bands behind the internarial, interorbital and scapular regions; dark barred thighs that are fused, running along the thighs over the cloaca and up the inguinal region. The specimen (sex unspecified) measured by RAO (1937: 419-420) was 25.0 mm in snout-vent length, while the two specimens being reported here (both females) measure 25.9 mm (MCZ A.116283) and 29.6 mm (MCZ A.15421).

However, the two new specimens do not fit the original description of RAO (1937) in a couple of apparently fundamental characteristics. Both specimens show a distinct occipital fold (see fig. 3), which was reported absent in RAO's specimens, and they show a conspicuous supratympanic fold, described as "inconspicuous" by RAO (1937) Since the new locality (in Goa) is over 300 km from the type locality, such variation is not remarkable. In addition, many of RAO's (1937) types were clearly desiccated specimens, which may account for the damage to dermal features. In *Ramanella montana* (Jerdon, 1854), *Ramanella obscura* (Günther, 1864), *Ramanella variegata* (Stoliczka, 1872) and *Ramanella triangularis* (Günther, 1876), the occipital fold is occasionally absent (see PARKER, 1934).

Ramanella mormorata differs from all its congeners in coloration. Its small, dark blotches and transverse bands contrast with the dark, median, hour-glass figure of *R. montana*, *R. obscura*, *R. palmata* and *R. triangularis*, with the broad median, dark band of *R. anamalaiensis*, and with the broad, dark triangle on the anterior part of the dorsum of *R. minor*. *R. mormorata* also differs from *R. obscura*, *R. palmata*, *R. triangularis* and *R. variegata* in having the eye-snout distance greater than the diameter of the eye (vs. eye-snout equal to or less than eye diameter in its congeners), well-developed post-choanal ridges (indistinct or absent in *R. anamalaiensis* and *R. variegata*) and toes weakly webbed (vs. free in *R. anamalaiensis* and *R. minor*, webbing on toe IV reaching the basal subarticular tubercle as a broad sheath and continuing as a narrow sheath to the base of the swollen tips in *R. montana*, and up the distal subarticular tubercle in *R. palmata*). *R. mormorata* differs from *R. minor* in showing internarial distance greater than the upper eyelid width (vs. equal). It also differs from *R. montana* in showing a broad median gap between the post-choanal ridges (vs. ridges nearly in contact) and free fingers (vs. fingers distinctly webbed, fide Parker, 1934) and from *R. obscura* in having a supratympanic fold thin (vs. with a parotoid-like thickening).

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Alytes, 1997, **15** (3): 133-136. *Book review*

An evolutionary biologist's view on the science of biology

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MAYR, Ernst. – ***This is biology. The science of the living world.*** Cambridge, Massachusetts & London, England, The Belknap Press of Harvard University Press, 1997: i-xvii + 1-327.

Born in 1904, Ernst MAYR is now a living legend of evolutionary biology His countless original contributions to the development of this discipline were published in about 650 journal articles and about twenty major books, starting with *Systematics and the origin of species* (1942), and going through landmarks such as *Animal species and evolution* (1963), *Principles of systematic zoology* (1969) or *The growth of biological thought* (1982). Ernst MAYR's last book, *This is biology* (1997), his last brilliant contribution to the understanding of the unique characteristics of biology among the sciences and of its particular philosophical bases, is of particular importance for all biologists. It provides a detailed analysis of several major questions often put by biologists, by scientists of other disciplines, and by lay persons, about the science of the living world.

Much has been written about the history and epistemology of biology, but many of the authors of these works were historians of science or philosophers, not biologists. The interest and significance of MAYR's new book come mostly from its having been written by a biologist, who has an inside understanding of the problems of this scientific field. As is very aptly shown by MAYR in this book, the philosophy and history of science have long been dominated by a "conception of science" derived from *physics*, and such a conception cannot address many aspects of the science of life. The characteristics of biology are very different from those of physical sciences and other sciences of matter, and generalisations drawn from the study of the latter often do not apply to biology, because of the unique particularities of life among natural phenomena.

Among the important differences, physics and other matter sciences try and draw *laws* having a general, universal value. A long-prevailing conception has also tried to assign this aim to biology. Such a conception can be illustrated by sentences such as: "science only deals with general matters" or "if you explain the bacterium to me, I'll leave you quits with the elephant or man". In such a perspective, it would be enough to study in every detail a single kind of organisms (a bacterium, a fruit fly, a white mouse) to know everything about life. However, this reductionist perspective has severe limits.

For sure, a number of particularities are common to all or most organisms, such as the genetic code, the basic cellular biochemical and physiological processes, or certain characters common to members of major clades. But, beside these common features, organisms are more correctly characterized by their *diversity* and the diversity of their characters. Contrary to what the reductionist approach suggests, this diversity is not a secondary phenomenon, or a disturbing "noise" in the study of life, but it is the main characteristic of life. This diversity is the result of the *evolution* of organisms on our planet, which has involved two distinct mechanisms: a progressive *modification* of the characteristics of organisms within evolutionary lines (process of *anagenesis*), and a *multiplication* of the clades of organisms (process of *cladogenesis*) both mechanisms together are traditionally known as the process of *phylogenesis* While the terms phylogenesis, anagenesis and cladogenesis refer to *processes*, their *results* may be known together as *phylogeny*, and I further suggest that the components of the latter could be recognized separately as *anageny* and *cladogeny*. As a consequence, biology is characterized much less by the existence of *laws* than

by the fact that most of the characteristics of organisms can be explained because these organisms are the result of a *history* Although this is not fully understood by many biologists, much more than a *deterministic* science, biology is a *historical* science.

Another important particularity of biology, well underlined in MAYR's book, is that nothing makes sense in biology if one does not understand that biological phenomena have *several distinct levels of integration*. This means that the properties of an organism cannot be reduced to those of its cells or organs, those of a population to those of its individuals, etc At each level of integration, new particularities emerge, wich cannot be mechanically deduced from the particularities present at the immediately lower integrative level. This very old notion can be summarized in a sentence like: "the whole is more than the sum of its parts". It is qualified by Ernst MAYR, after others, under the term of *emergence*. Consideration of this characteristic of life is of paramount importance to understand many biological phenomena, and it supports a holistic, rather than a mechanistic or reductionist, approach to these phenomena.

Another strong quality of MAYR's book is to show in detail how, in science, several types of questions can be legitimately asked, and how these questions can be reduced to three major categories the questions "what", "how" and "why". Many scientists, and even biologists, tend to believe that the only "legitimate" scientific questions are "how" questions· how does such biochemical or physiological mechanism work, how does things work inside the "black box" of such behaviour, etc. Such questions can often be studied through an experimental approach, and, to this day, some biologists still tend to think that scientific knowledge can be obtained only through experimental method. This is easy to understand in countries, such as France, where biology has long been a mere subdiscipline of medicine, and where great historical figures in research are those of people, such as Claude BERNARD or Louis PASTEUR, who were wearing white gowns and devoted most of their life to laboratory experimental studies. The situation is different in Anglo-Saxon countries, where there exists a strong tradition of field naturalists, such as DARWIN or MAYR, which has facilitated the emergence of a different, more holistic, approach to biology

As a matter of fact, it is totally incorrect to state that the question "how" is the only legitimate question in science. This question allows to elucidate only one type of problems in biology, those which can be designated under the term "proximal causes" Thus the experimental method allows to answer a question such as "what is the environmental factor that determines the fact that an animal starts a seasonal migration?", but not the question "why did seasonal migrations appear in this species?". Such "why" questions aim at elucidating "evolutionary causes" of biological phenomena They are as legitimate as "how" questions, because in fact each biological phenomenon is the result of *two distinct causation systems*: evolutionary and proximal causes. More and more biologists have become aware of this double causation system and recognize the legitimacy of "why" questions in science Usually such questions cannot be answered to through the experimental method. They are the major questions which "evolutionary biology" asks. For a long time, the only answers to such questions were theological ones, but since 1859 and the development of the concept of *natural selection* it has been possible to provide scientific answers for them

But there is a third kind of questions in science these are "what" questions. Questions of this kind are the first ones man asks in front of the world: what exists, what are the major characteristics of what exists, etc. The answer to such questions requires to have recourse to observation, description, comparison or inventory Contrary to an ideology currently dominant in science, such questions are legitimate scientific questions. As long as no correct answer has been provided to them, the questions "how" and "why" are meaningless, or at least cannot be correctly set. "What" questions must therefore be respected and this also applies to those who study them. As a matter of fact, the dominant activity of scientists in all scientific fields (including the most "modern" ones) are of this kind. Careful and complete descriptions and inventories are the first steps that cannot be done without in all fields, including molecular biology (description and inventory of molecules and of their activities), genetics or ecology.

An important proportion of "what" questions in biology is the set of questions that relate to the inventory and classification of biodiversity. Given the importance of these questions in the previous works of Ernst MAYR, it is not surprising that he devoted a nice chapter to this topic in his new book. Once again, MAYR comes back in this book to the many problems related to the building of biological classifications, which he had already discussed in several other important works (MAYR, 1969, 1974, 1981; MAYR & ASHLOCK, 1993) He very persuasively shows how the different "schools" of macrotaxonomy,

and in particular the two dominant ones in the recent years (cladistics and evolutionary or "Darwinian" classification) do in fact differ in their objectives. The aim of an evolutionary *classification* is to provide a *taxonomy*, i.e. a hierarchical arrangement of *taxa*. The latter are *classes* that should be recognized on the bases of two criteria: genealogy (common descent) and degree of similarity (amount of evolutionary change). These two criteria correspond to the two dimensions of phylogeny: anageny and cladogeny. MAYR quite rightly suggests that arrangements of organisms built on the basis of cladogeny alone do not deserve the qualification of true classifications, but should rather be known as *cladifications*. The latter recognize units which are not classes (as are taxa), but clades, renamed by MAYR (1995) as *cladons*. To complete MAYR's terminological clarification, some other terms can be useful: the term *phylon*, first proposed by DUBOIS (1991) to designate the concept later called cladon by MAYR (1995), would be more appropriate to designate a phylogenetic s.l., i.e. both anagenetic and cladogenetic, unit. Following MAYR's conception of classification, the term phylon is therefore a strict synonym of the term taxon. While classification according to phylogeny s.l., i.e. both anageny and cladogeny, gives birth to what can be called either a *taxonomy* or a *phylonomy*, cladification, i.e. classification based on cladogeny alone, results in a *cladonomy*, not properly a taxonomy. The differences between the two systems can also be stressed when one considers the way characters are used to define taxa. In a traditional taxonomy, a taxon can validly be *diagnosed*, i.e. characterized by a *diagnosis* (or *taxognosis*, or *phylognosis*): this is a set of *differential* or *diagnostic* characters, both plesiomorphic and apomorphic ones, that characterize this taxon and distinguish it from related ones. On the other hand, in a cladonomy a cladon needs only be *apognosed*, i.e. characterized by an *apognosis* (or *cladognosis*, or more shortly *clagnosis*): the latter only includes *apognostic* characters, i.e. autapomorphic characters of the cladon, not shared with closely related ones.

Such terminological discussions may appear gratuitous or superfluous to some, but they are not. As shown on several occasions in MAYR's book, during the whole history of biology, many scientific debates, discussions and conflicts turned out to be ultimately caused by terminological confusions. Many so-called disagreements between colleagues simply take their root in the fact that these different biologists used the same term in different senses. Introduction of the term cladification is therefore a particularly useful contribution, which hopefully will be followed by all evolutionary biologists and systematists. It will help more and more people to understand that both classification and cladification may be legitimate, but that they do not have the same objectives. Evolutionary (or Darwinian, or synthetic) classifications serve multiple purposes, both practical and theoretical: their aim is to provide a hierarchical arrangement of taxa, the latter being non-polyphyletic and homogeneous groups of populations or taxa, about which the highest possible number of generalisations and predictions can be made. On the other hand, the aim of a Hennigian cladification is merely to give a transcription, under the form of a hierarchical arrangement, of a cladogram, and therefore to provide information on the branching pattern of clades in the phylogeny of a group. Both aims may be justified, depending on the information one wants to obtain, but it is important not to confuse both kinds of information storing systems.

Another clarification is wanting in MAYR's new book, as in his previous texts: MAYR rightly stressed on several occasions that the term *monophyletic* was used by cladists for a concept quite different from that designated by HAECKEL (1868) when he coined this term. As a result, in this book MAYR once again claims that the term monophyletic (and its derivative monophyly) should be restored in their original senses. Given the number of recent publications where these terms were used in HENNIG's (1950) new sense, I do not think this restoration will ever take place for all biologists, and, in my opinion, in order to avoid the continuation of confusion, these terms should be abandoned altogether. For "monophyletic sensu HENNIG" (i.e., a qualification of a group which is both non-polyphyletic and non-paraphyletic), ASHLOCK's (1971) term *holophyletic* should be used. For "monophyletic sensu HAECKEL" (non-polyphyletic), DUBOIS's (1986) term *homophyletic* is available. My feeling is that in this case one should follow the same line of reasoning as that advocated by MAYR & ASHLOCK (1991: 276-277) regarding the case of the terms *character*, *character state*, *signifer* and *signifer state*: "We realize that the character-character state terminology has been too widely adopted to be easily dislodged. Therefore, any endeavor to restore the traditional meaning of the word *character* would cause considerable confusion. Hence, although with considerable reluctance, we use *character state* for what traditionally has been called a character." A similar "considerable confusion" might arise from a continuous effort to restore the traditional meaning of the term monophyletic, and much clarification would come from a rejection of this term and its replacement by either holophyletic or homophyletic according to the purpose.

MAYR's book is still rich of many other stimulating discussions and analyses. After "what" questions, case studies of "how" and "why" questions allow to illustrate other important epistemological aspects of biology as a science with no equivalent among other scientific fields. Two chapters are devoted to the kind of questions that ecology asks, and to the status of our knowledge about human evolution. Possibly the least convincing chapter is the last one, which deals with the relationship between our knowledge of biological facts (and mostly evolution) and ethics. This chapter could have benefited from consideration of other works published on this matter by authors not mentioned by MAYR, such as the numerous books of Jean ROSTAND, to give only one example. Strangely, regarding human phenomena, MAYR seems to share the conventional reductionist attitude of many other biologists, who think that most psychological and social human features can be explained in terms of biology – if not simply of "common sense" (see e.g. pp. 39-40, 254, 260, 264-265, 267). However, here also, *emergence* is at work. It is as misleading to analyse these high-integration-level phenomena with biological concepts as to analyse biological phenomena with concepts from biochemistry or physics. During the last century, all scientific disciplines dealing with man (psychology, social sciences, economics, etc.) showed a great development and experienced several "scientific revolutions" as significant as those of GALILEO and DARWIN in their respective fields. Unless one is ready to accept that man, being "special among God's creations", cannot be studied scientifically, these developments must be duly considered. In order to adopt a scientific attitude in this respect, there is the same need of terminological and conceptual clarity and rigour as that aptly advocated by MAYR himself regarding biology, and, because scientists are humans, "common sense" is even more misleading here as it is in biology. Ignorance by MAYR of most of the significant works and theories concerning human behaviour, psychology and society severely limits the interest and reach of this chapter of his book.

No one now knows what the biology of the next century will be. Concerning the part of this science that deals with the diversity of life (systematics), which has attracted most of the attention of MAYR in his works, some authors (e.g.: CROWSON, 1970; DUBOIS, 1988) have suggested that "experimental systematics", dealing in particular with developmental problems, might be the next important step in this old research field. Whatever the case may be, terminological and conceptual clarifications will be of paramount importance for future progress of the discipline, and MAYR's works will have provided a lot of new and useful elements in this respect.

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SHORT GUIDE FOR AUTHORS

(detailed *Instructions to Authors* are given in *Alytes*, 1997, **14** (4): 175-200)

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BOURRET, R., 1942. – *Les Batraciens de l'Indochine*. Hanoï, Institut Océanographique de l'Indochine: i-x + 1-547, pl. I-IV.

GRAF, J.-D. & POLLS PELAZ, M., 1989. – Evolutionary genetics of the *Rana esculenta* complex. *In*: R. M. DAWLEY & J. P. BOGART (eds.), *Evolution and ecology of unisexual vertebrates*, Albany, The New York State Museum: 289-302.

INGER, R. F., VORIS, H. K. & VORIS, H. H., 1974. – Genetic variation and population ecology of some Southeast Asian frogs of the genera *Bufo* and *Rana*. *Biochem. Genet.*, **12**: 121-145.

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